VTX Software Update

what's new since September

Sasha Lebedev, ISU

- VTX standalone studies
  - vertex reconstruction
  - DCA measurement
  - charm/bottom separation

- KalFit news
  - DCA optimization
  - D^0 to $K\pi$ first look

- Radiation length vs vetex Z

- “new” J/ψ results

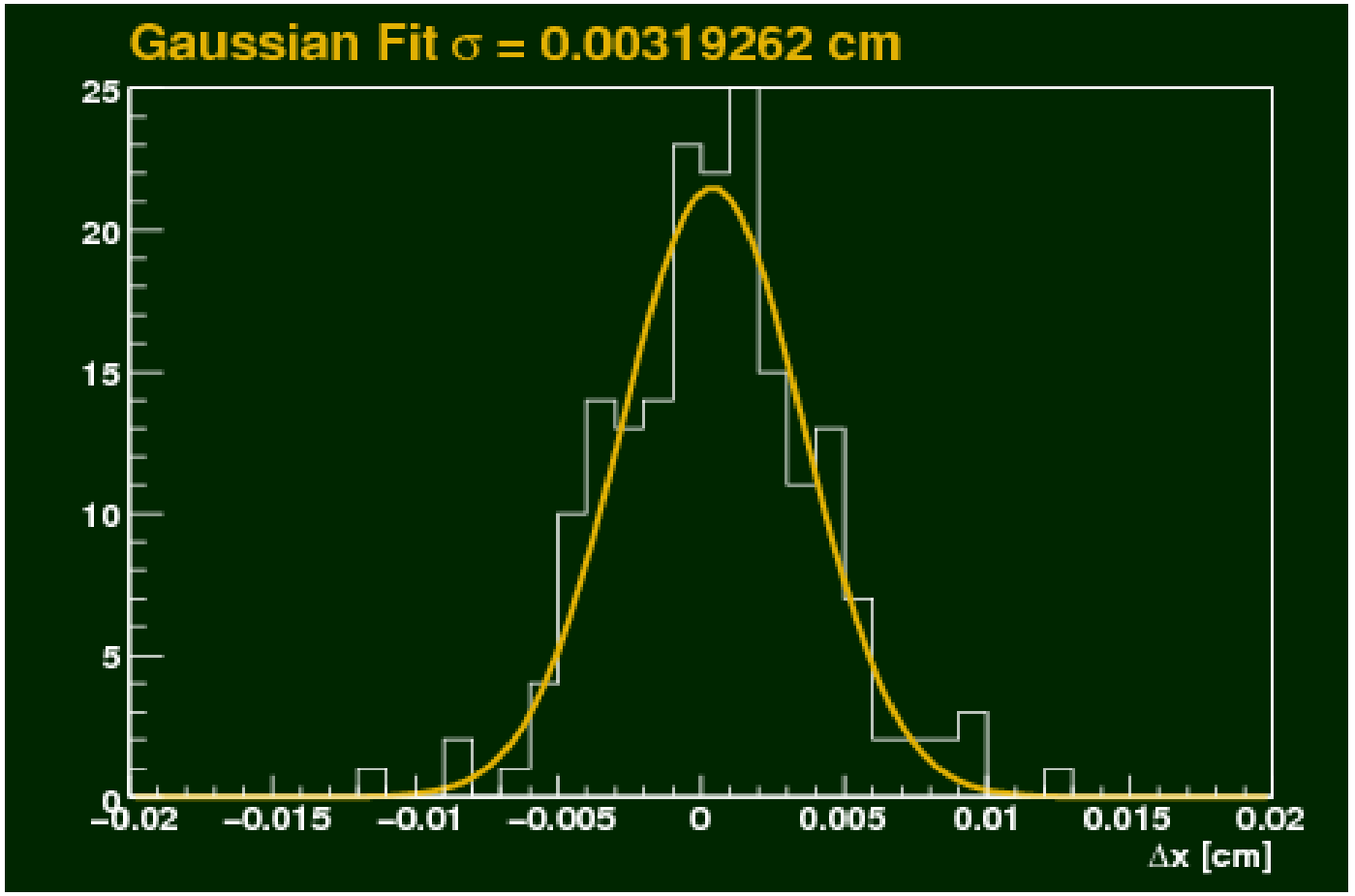
VTX Quarterly Meeting, December 9, 2008

Event vertex reconstruction with VTX

Alan Dion

SvxInitialVertexReco: fast guess, few mm resolution, standalone

SvxVertexReco: ~30μm resolution in X and Y, ~70μm in Z, uses global tracking info

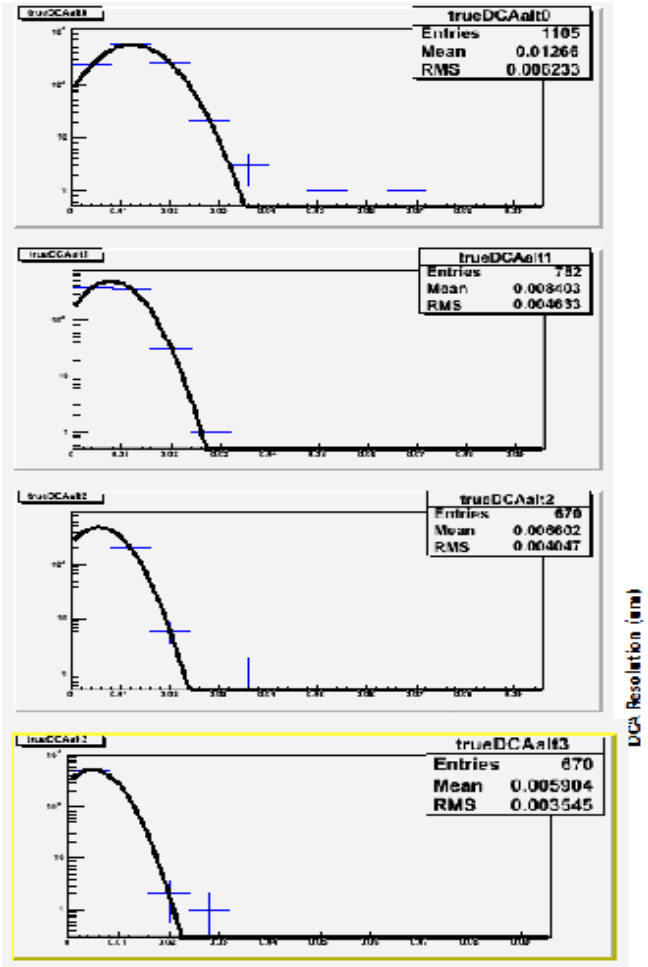


VTX standalone DCA calculation

Richard Petti

Straight line projections (ignoring magnetic field)

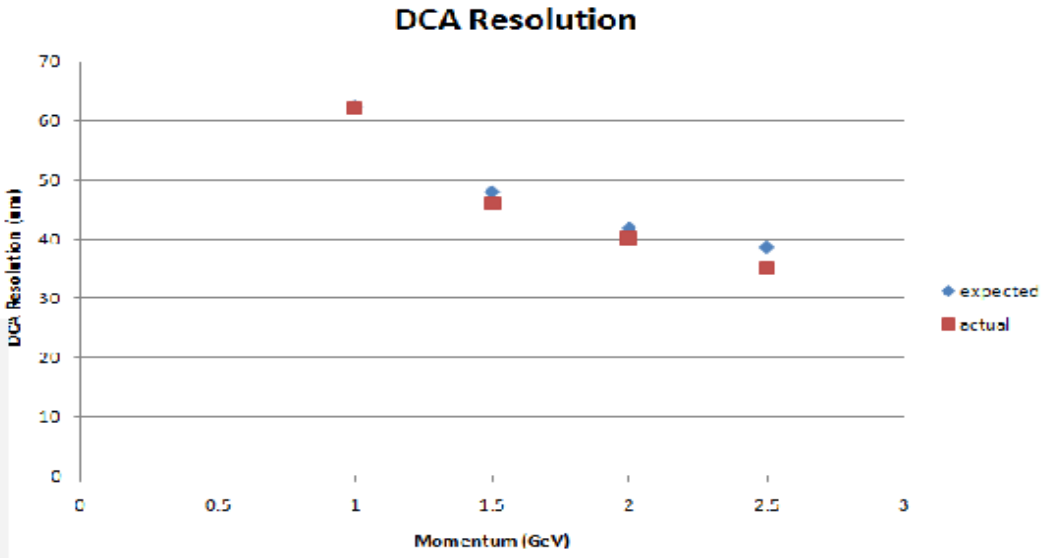
- Electrons from vertex



DCA Resolution

- Expected Resolution

$$\sigma^2_{DCA} \approx \frac{\left(\sigma_1^2 r_2^2 + \sigma_2^2 r_1^2\right)}{(r_2 - r_1)^2} + \theta_{ms}^2 \frac{r_1^2}{\sin^2\theta}$$

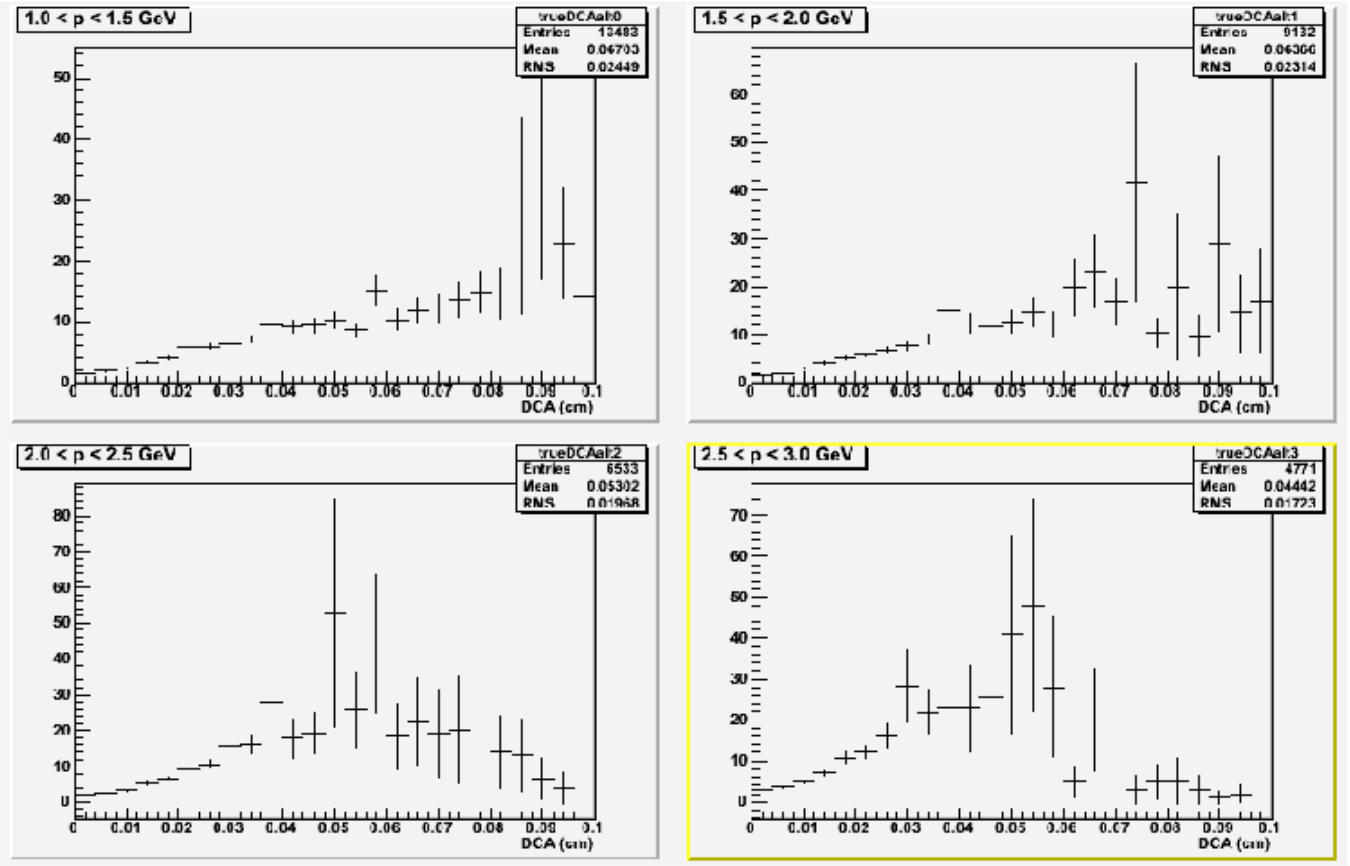


VTX standalone charm/bottom separation

Richard Petti

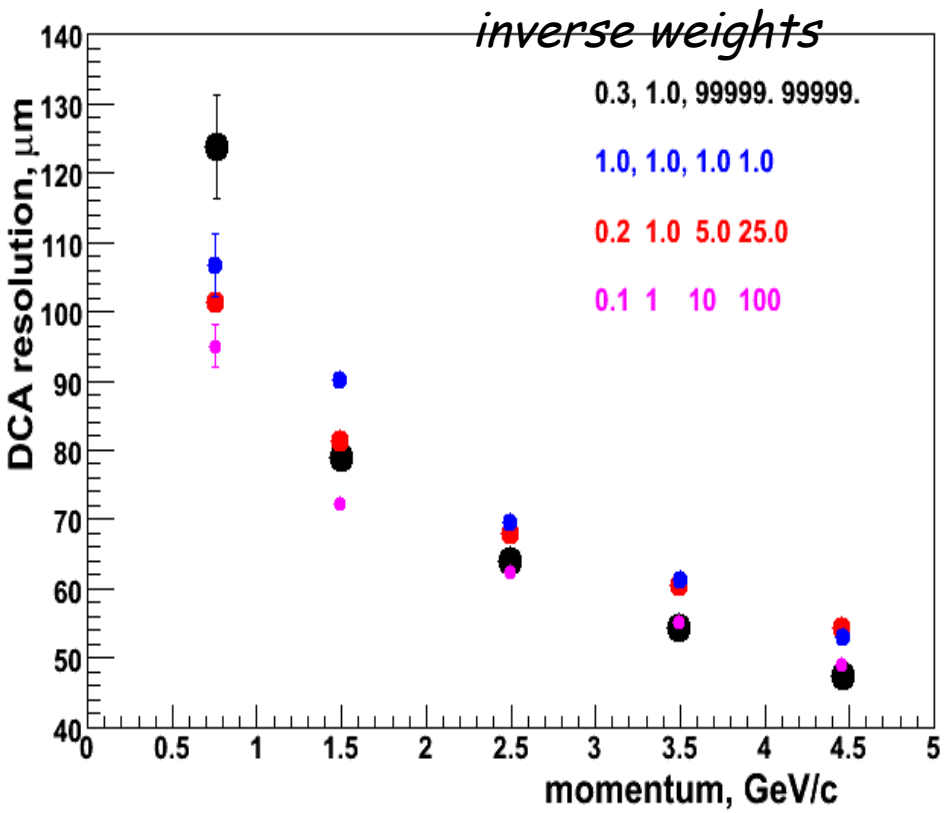
- B and D mesons with realistic distributions
- Apply dca cut to select bottom over charm
- No absolute normalization

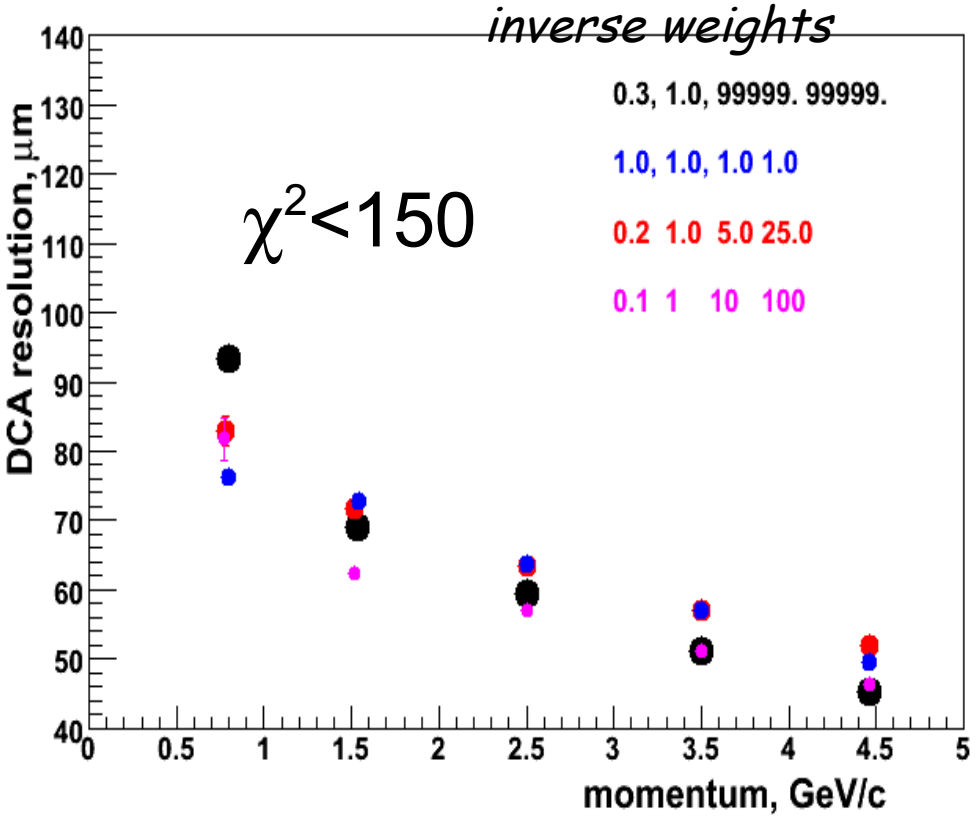
Bottom/Charm Ratio - clusters



KalFit DCA resolution optimization

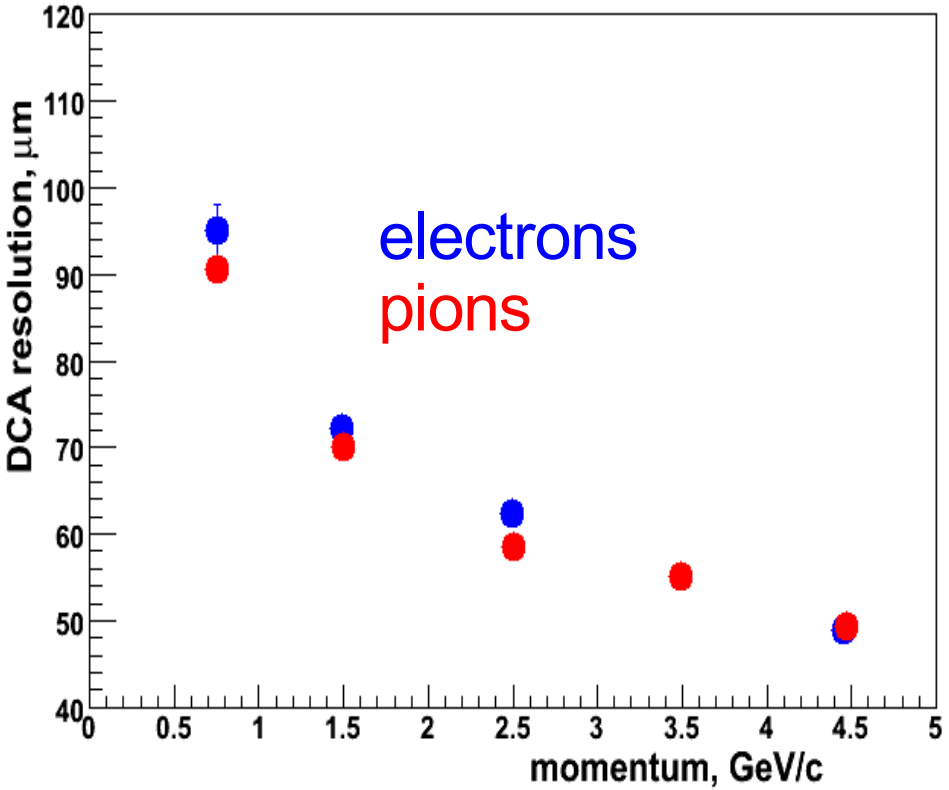
- Change weights assigned to hits from different layers, and try to find the best combination.
- Best results when inner layers have large weight, outer layers small weight.
- Even without strip layers we have good resolution.

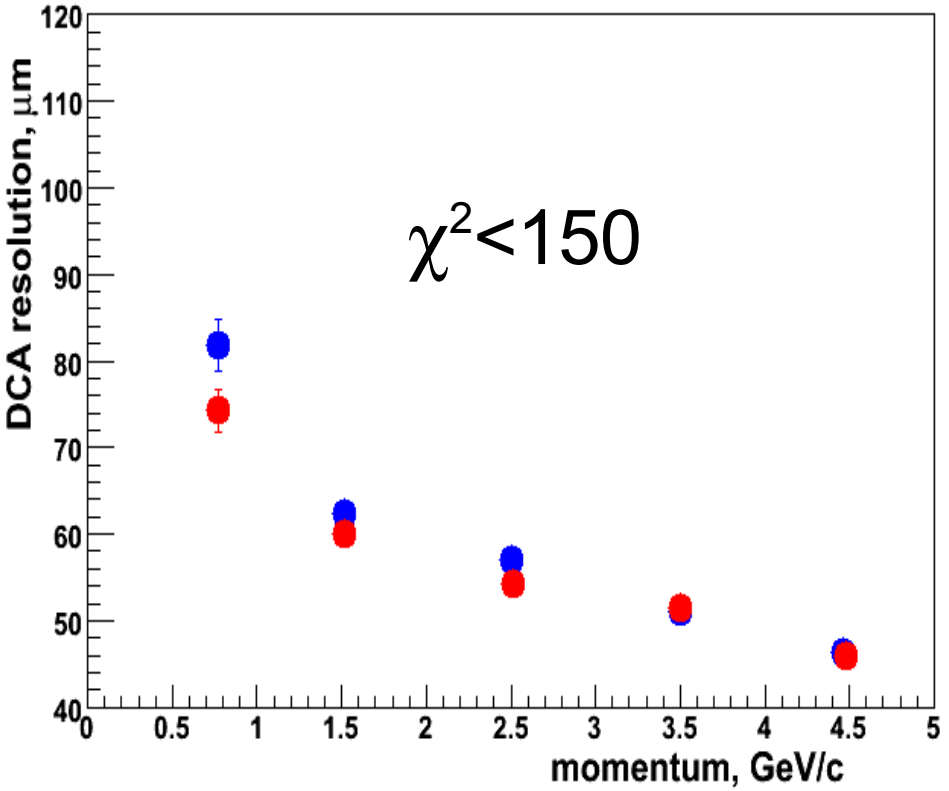




KalFit DCA resolution vs P_T for e and π

Resolution somewhat worse than standalone results
John Lajoie is working on improving KalFit
- off-diagonal elements in propagation matrix (correlated displacement)
- r-z-phi errors instead of x-y-z

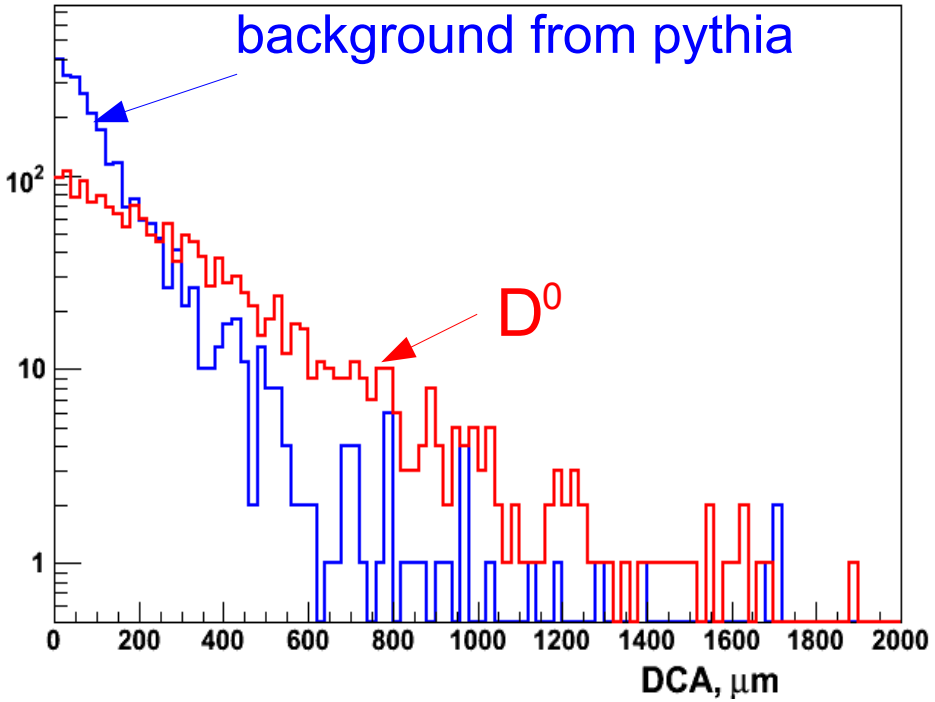


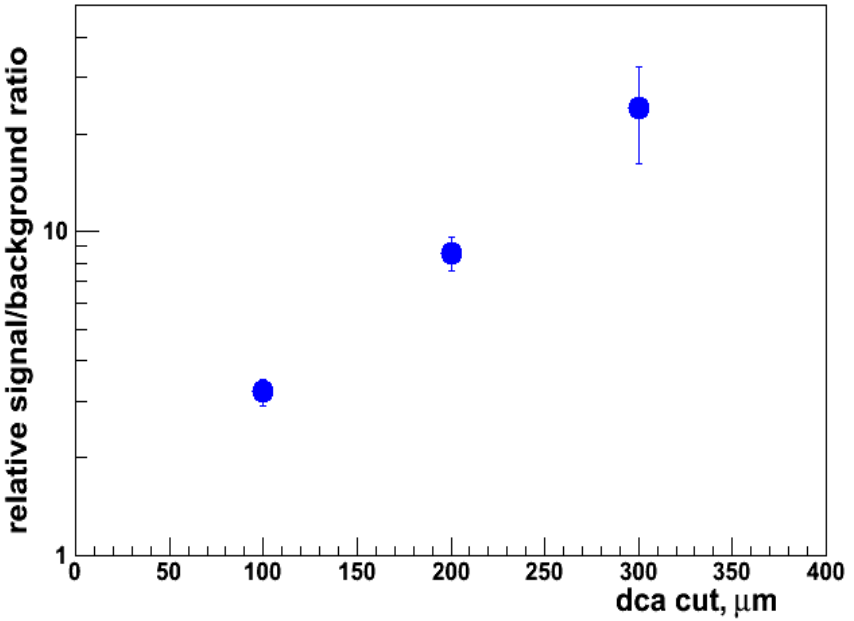


First look at D° to Kπ using KalFit

- Generate single D^0 using pythia (signal).
- Generate pythia min. bias pp events as background.
- Run both samples through PISA and full reconstruction.
- Apply cuts to reduce background:
  - DCA cuts
  - Two-track closest approach

Distributions are not normalized

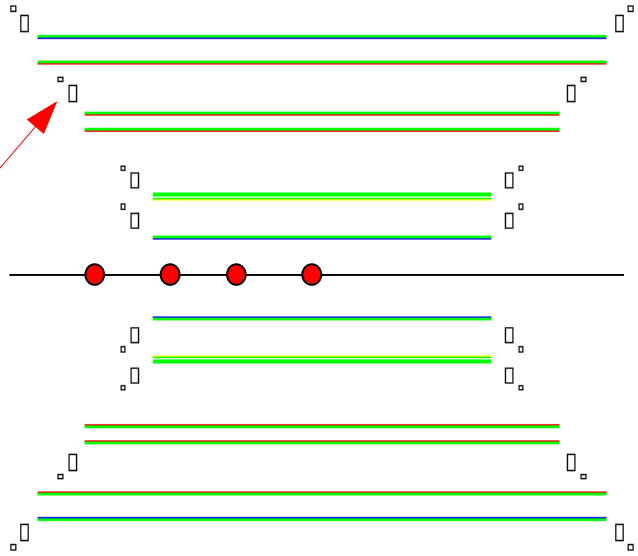




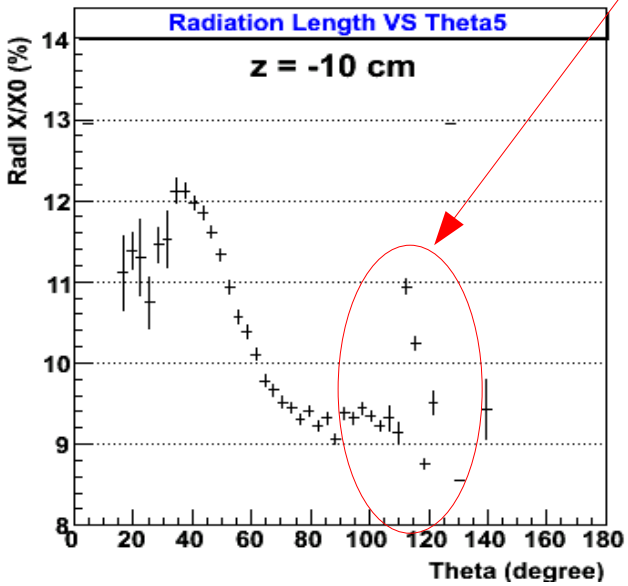
After applying dca cut, other cuts seem to be much less effective

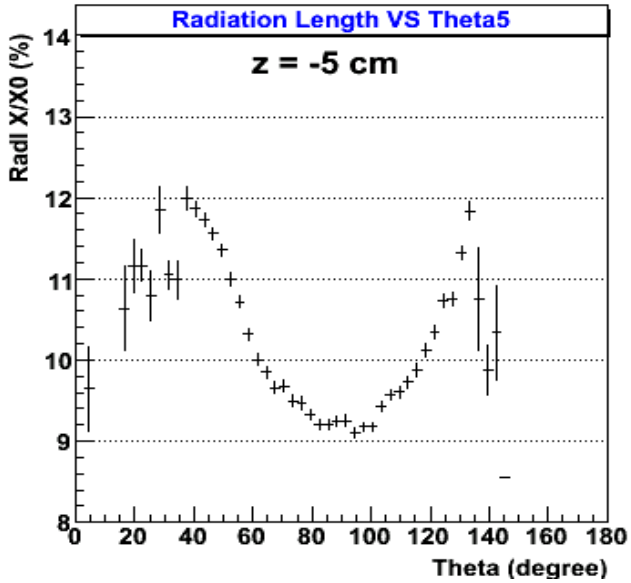
Radiation length vs vertex Z

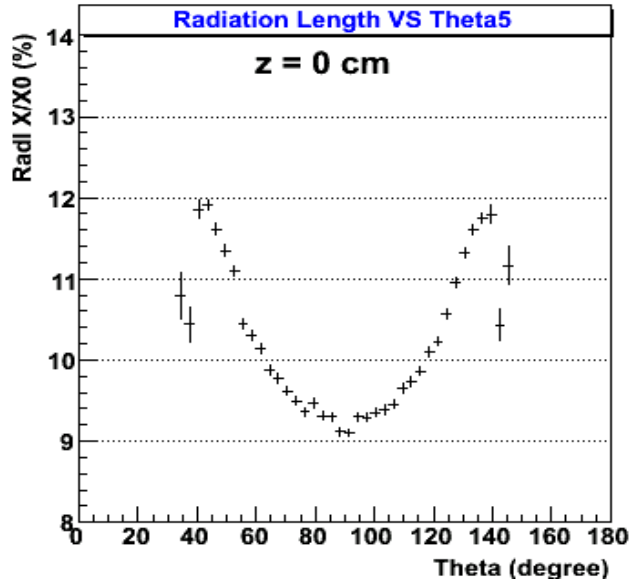
Maki Kurosawa



support ring







In the process Maki found that support ring was in the wrong place

“new” J/ψ results

After fixing the bug in PISA

	No VTX	2 layers	full VTX
Efficiency			
within 3 sigma		82.2%	64.5%
above 2.5 GeV		92.1%	83.3%
Mass resolution (MeV)	36.5	40.2	44.3